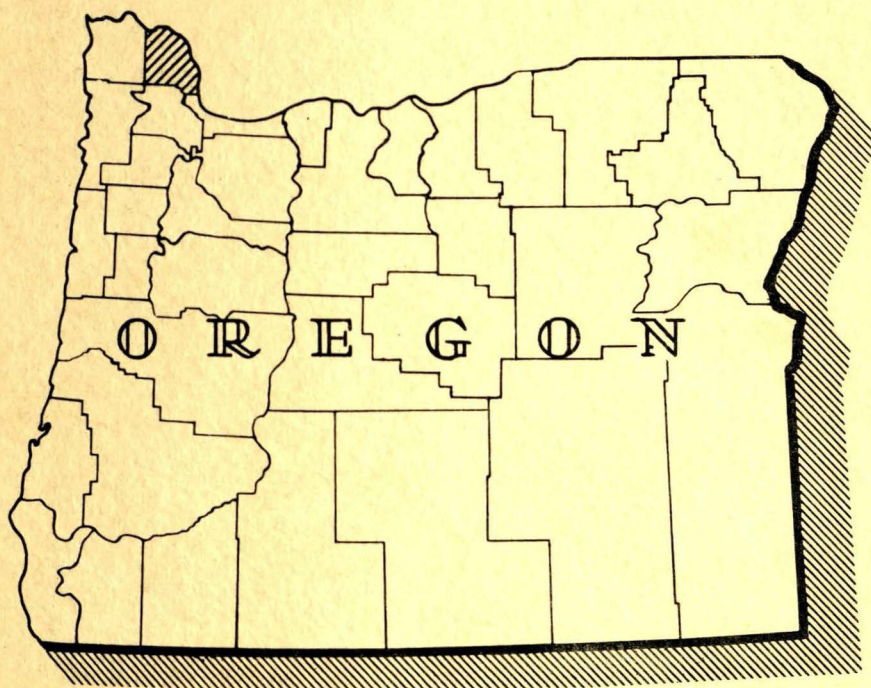


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FOREST STATISTICS FOR COLUMBIA CO., OREGON

FOREST SURVEY REPORT NO. 122



U. S. DEPARTMENT OF AGRICULTURE · FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
R. W. COWLIN, DIRECTOR

PORTLAND, OREGON



OCTOBER 1955

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¹/ Acknowledgment is made of cooperation from public and private agencies in furnishing timber cutting and ownership records.

FOREST STATISTICS

This publication summarizes the results of a reinventory of the forests of Columbia County, Oregon, conducted in 1954. This reinventory is a part of the nationwide Forest Survey, a nationwide project of the Forest Service authorized by the McCarthey-McNary Act, Public Law 56-280, June 30, 1949. The purpose of the Forest Survey is to periodically inventory the extent and condition of forest lands and the timber and other products. Forest Survey Report No. 122: forest growth and yield, to estimate present consumption of timber products, and to analyze and make available to the public survey information needed for the formulation of forest policies and programs.

F. L. Moravets

The Forest Survey is conducted in the various forest regions of the Nation by the regional forest experiment stations of the Forest Service. In the Pacific Northwest region of Oregon and Washington, it is an activity of the Pacific Northwest Forest and Range Experiment Station at Portland, Oregon.

Under the initial phase of the Forest Survey, the forests of Columbia County were inventoried in 1932. Under that inventory was prepared a 1932-33, and a statistical report "Forest Statistics of Columbia County, Oregon" and a detailed forest type map, one mile to the mile—were released. In 1954 the second reinventory of the county's forests was made and a revised statistical report and forest type map prepared.

Following the second reinventory in 1954 the forest type map has been revised again and is available as a series of sheets, one to the mile. 1/

U. S. Department of Agriculture Forest Service
Pacific Northwest Forest and Range Experiment Station

R. W. Cowlin, Director
October 1955

FOREWORD

This publication summarizes in statistical form the results of a reinventory of the forests of Columbia County, Oregon, conducted in 1954. This reinventory is a part of the maintenance phase of the Forest Survey, a nationwide project of the Forest Service authorized by the McSweeney-McNary Forest Research Act of 1928 and amended June 25, 1949. The purpose of the Forest Survey is to periodically inventory the extent and condition of forest lands and the timber and other products on them, to ascertain rates of forest growth and depletion, to estimate present consumption of timber products, and to analyze and make available in reports survey information needed in the formulation of forest policies and programs.

The Forest Survey is conducted in the various forest regions of the Nation by the regional forest experiment stations of the Forest Service. In the Pacific Northwest region of Oregon and Washington, it is an activity of the Pacific Northwest Forest and Range Experiment Station at Portland, Oregon.

Under the initial phase of the Forest Survey, the forests of Columbia County were inventoried in 1930. Later that inventory was adjusted to 1932-33, and a statistical report "Forest Statistics for Columbia County, Oregon" and a detailed forest type map—scale 1 inch to the mile—were released. In 1938 the first reinventory of the county's forests was made and a revised statistical report and forest type map prepared.

Following the second reinventory in 1954 the forest type map has been revised again and is available on a scale of either 1 or 2 inches to the mile. 1/

1/ A print of the forest type map is available at cost of blue-printing. For information write Director, Pacific Northwest Forest and Range Experiment Station, P. O. Box 4059, Portland 8, Oregon.

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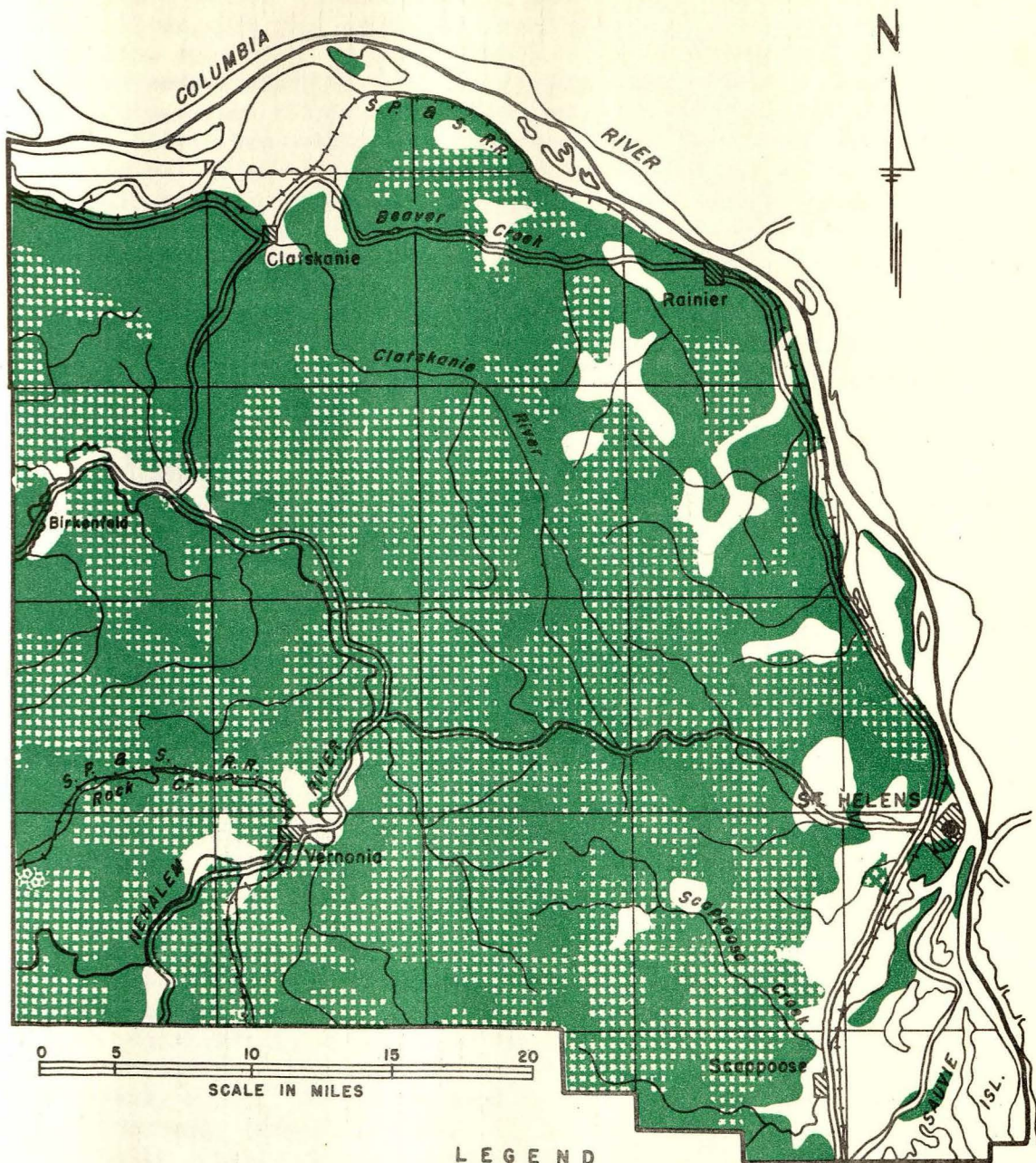
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FIGURE 1
FOREST STAND - SIZE AND CONDITION CLASSES
 COLUMBIA COUNTY, OREGON
 1954



LEGEND

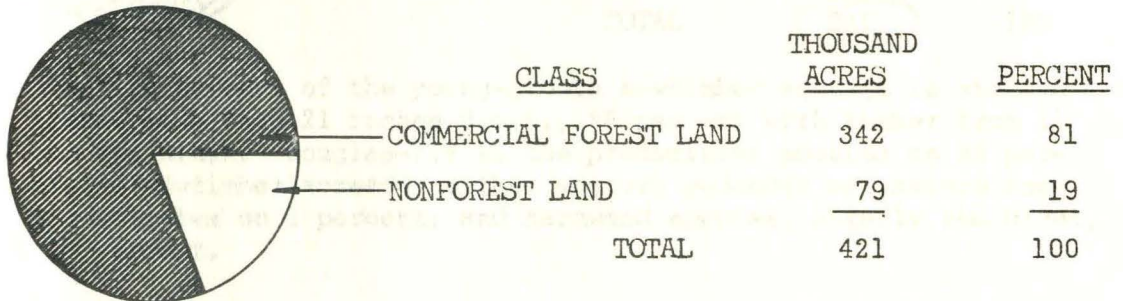
- | | | | |
|---|---|---|--------------------------|
|  | Sawtimber stands |  | Nonstocked cutover areas |
|  | Poletimber, seedling and sapling stands |  | Nonforest land |

SIGNIFICANT FINDINGS IN THE FOREST INVENTORY

LAND CLASSIFICATION

Columbia County, situated in northwest Oregon, fronts on the lower Columbia River. It is a small county, roughly 25 miles square and has a total land area of 421 thousand acres. In relief most of the county's surface is moderately broken--a low mountainous terrain generally of short, medium-steep slopes, rounded ridges and numerous, small shallow valleys. Elevations vary from a few feet above sea level along the Columbia River to about 2,000 feet on a few of the ridge tops. A narrow flood plain varying from one to five miles wide lies along the Columbia River. The north half of Sauvie Island, a large island that extends southward out of the county, lies in this flood plain.

At the time of the early white settlements in the first half of the nineteenth century, the county was heavily forested except on portions of the river flood plain. Most of the stands were old-growth timber; some were young timber that had restocked burns.



A century of logging, small scale for the first 75 years and large scale in the remaining 25 years, covered virtually all of the county, and by the early 1940's had removed all but a few small remnants of the original stand. During this time agriculture had been limited chiefly to the diked flood plains and to narrow bottomlands along some of the stream courses. Attempts were made during the 1930's to convert a considerable acreage of cutover forest land to agricultural use for farm crops and grazing but these were very largely unsuccessful.

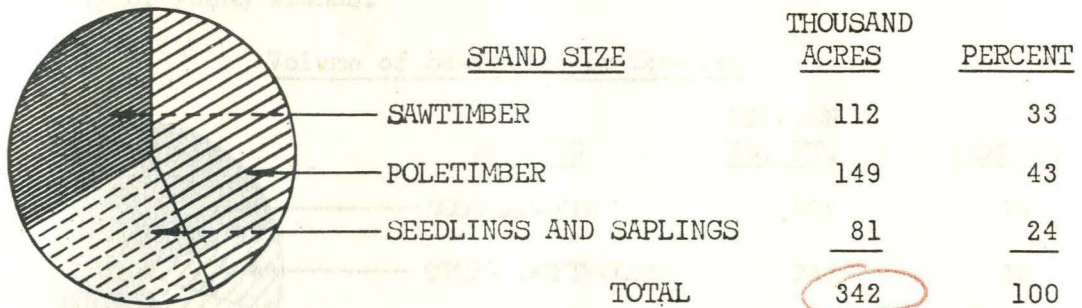
Recurring fires and the temporary agricultural use of logged areas materially slowed forest regeneration of portions of the county. However, in recent years, with better fire control, an improved public attitude regarding fires, and the abandonment of agriculture on cutover lands, nearly all of the forest land is again stocked, this time with young, vigorously growing stands. All of the forest land in the county is physically capable of producing merchantable crops of wood; most of it is of high productivity. Also, none is reserved from timber utilization. Of the nonforest land, 68 thousand acres is in agricultural use as cropland or pasture; 4 thousand acres is natural grass or brush; and 7 thousand acres is in towns, industrial sites, and tidelands.

FOREST LAND

The inventory found a total of 342 thousand acres of forest land in the county. All of this acreage was classed as commercial forest land.

Commercial Forest Land by Stand-Size Class

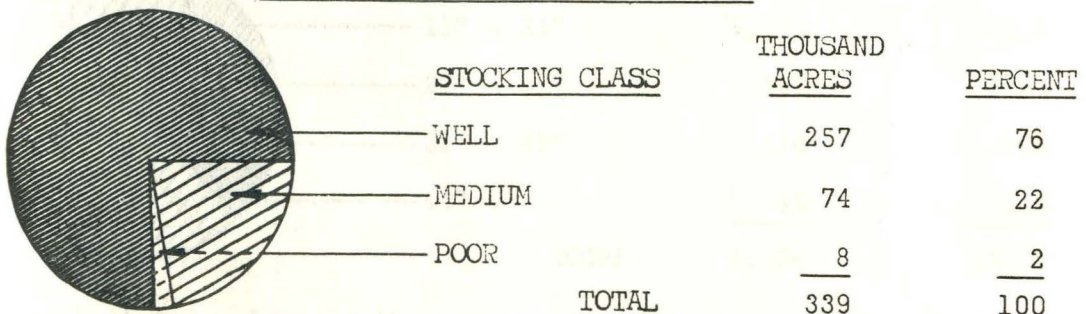
Logging has removed all of the original old-growth sawtimber in the county except a few small remnant stands covering a total of about 2 thousand acres. Young-growth sawtimber stands cover 110 thousand acres.



About 12 percent of the young-growth sawtimber acreage is stocked with timber more than 21 inches d.b.h., 88 percent with timber from 11 to 21 inches d.b.h. Douglas-fir is the predominant species on 89 percent of the sawtimber acreage; either western redcedar or western hemlock predominates on 1 percent; and hardwood species, chiefly red alder, stock 10 percent.

Douglas-fir is the key species on 93 percent of the combined area of 230 thousand acres of poletimber and seedling and sapling stands; on nearly all of the remainder red alder is the key species. There are a few hundred acres on which either western redcedar or western hemlock is the predominant species. Only 430 acres of forest land are non-stocked.

Stocking of Young-Growth Stands



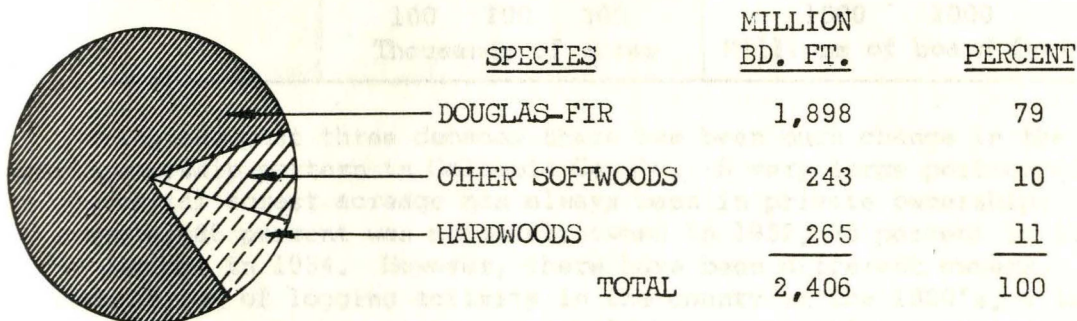
In classifying young-growth stands by stocking, all commercial tree species of all sizes are considered in determining the degree of stocking. Thus, a well-stocked sawtimber stand may contain trees of seedling, sapling or pole size as well as the dominant sawtimber trees. Red alder is a common minor component in stands of Douglas-fir type, and stands of red alder type may contain a minor composition of one of the softwoods, generally Douglas-fir.

Scribner's Int. 1/4 = 113.0570

TIMBER VOLUME

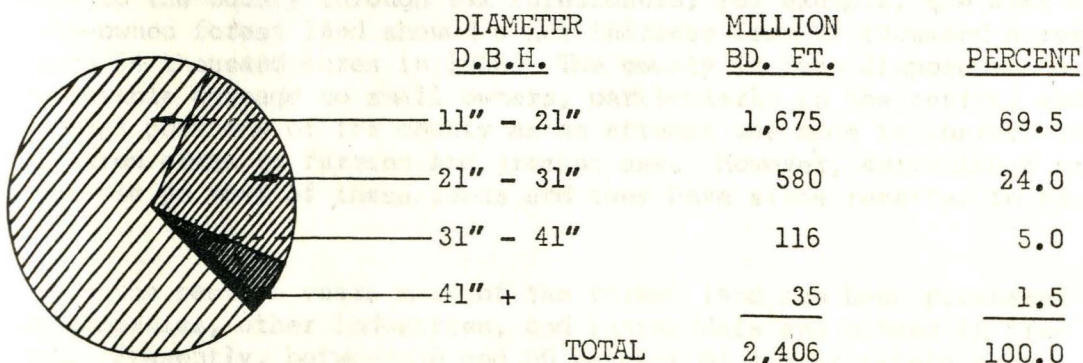
Net volume of live sawtimber trees (11 inches d.b.h. and larger) is estimated to total 2,406 million board feet, log scale, Scribner rule, or 2,720 million board feet, International $\frac{1}{4}$ -inch rule. Eighty-five percent of this volume is in sawtimber stands; the remainder is in scattered sawtimber trees in the overstory of young stands. Net volume of growing stock (live trees 5 inches d.b.h. and larger, including trees of both poletimber and sawtimber size) is estimated to be 668 million cubic feet. Of this volume, 77 percent is in sawtimber stands and 23 percent in the overstory of young stands.

Volume of Sawtimber by Species



Douglas-fir is predominant on all but a small portion of the commercial forest land and is frequently in pure stands. The other softwoods--western redcedar, grand fir, western hemlock, and Sitka spruce--are occasional associates of Douglas-fir. Two-thirds of the hardwood volume is red alder and most of the remainder is bigleaf maple. Oregon white oak, black cottonwood and Oregon ash occur in small quantities.

Sawtimber Volume by Diameter Class



All of the volume in the two smaller diameter classes and the major portion of the volume in the third class (31" - 41") is young-growth timber (under about 160 years of age). Most of the volume in the largest diameter class is old-growth timber.

FOREST OWNERSHIP

Ownership class	Commercial forest land			Sawtimber volume		
Private			92%			94%
State	3%			3%		
Bur. of Land Mgt.	3%			1.5%		
Other public	2%			1.5%		
	100 200 300 Thousands of acres			1000 2000 Millions of board feet		

During the past three decades there has been much change in the forest ownership pattern in Columbia County. A very large portion of the commercial forest acreage has always been in private ownership; for example, 86 percent was privately owned in 1932, 75 percent in 1938, and 92 percent in 1954. However, there have been different owners. In the peak period of logging activity in the county in the 1920's, a large portion of the sawtimber acreage was held by some ten large owners. By the late 1930's, all but three of these holdings had been cut out and, of the three remaining, only one had an appreciable acreage of uncut timber left. Logging of the sawtimber of the last large owner was completed during World War II.

Few of the original large owners were interested in retaining their cutover lands for future timber crops and practically all of their acreage has passed into other hands. Large areas of the deforested land reverted to the county through tax foreclosure; for example, the area of county-owned forest land showed a net increase from 27 thousand acres in 1932 to 64 thousand acres in 1938. The county in turn disposed of a considerable acreage to small owners, particularly in the central and southeast portions of the county as an attempt was made to convert the deforested areas to farming and grazing use. However, agriculture proved infeasible on most of these lands and they have since reverted to forest use.

In the past 15 years much of the forest land has been purchased by pulp companies, other industries, and individuals and placed in tree farms. Presently, between 40 and 50 percent of the privately owned acreage is so held. Thus, there is now an entirely new set of forest owners. In the aggregate private owners have 314 thousand of the total of 342 thousand acres of commercial forest land.

The State's forest ownership totals about 11 thousand acres of commercial forest land. This acreage was acquired largely through the

county by tax-foreclosure procedure. A portion of the acreage is in hardwood timber on Sauvie Island in a State game management area.

Federal lands managed by the Bureau of Land Management total about 11 thousand acres. These lands are revested O and C railroad grant lands in the southeast portion of the county.

Four of the towns own forest land as watersheds. The timber on the 4 thousand acres of municipal lands will be available for cutting.

Forest lands in county ownership in 1954 totaled only 870 acres.

FOREST UTILIZATION

Logging and sawmilling operations in Columbia County were among the earliest in Oregon. They began with the first white settlements in the area, some of which date back to about 1820. These early operations selectively cut the large high-grade timber fronting on the Columbia River and skidded the logs to the water by bull teams. They remained small scale until about 1910 when railroad- and high-lead logging began opening up practically all portions of the county to supply logs for a rapidly growing sawmill capacity up and down the Columbia River. By the 1920's the county's log production was definitely large scale and, with the exception of neighboring Clatsop County, the largest in the State. A peak production was reached in 1927 when a total of 527 million board feet of logs was reported. The average annual production for the five years, 1925-29, was 505 million.

A decline in log production began in 1930 and continued gradually as the several different large timber holdings were cut out. This decline extended until 1951 when a total of only 35 million board feet of logs was reported; since then production has started climbing as some of the young-growth stands are beginning to be harvested. Production in 1954 was 55 million board feet.

Because of its strategic location on the Columbia River, navigable by all classes of shipping, the county has long had a large installed capacity of sawmills. Two pulp plants, built in the late 1920's, have operated continuously and there have been various other forest industries. During a period of peak operation, 1925-29, sawmills in the county with a combined 8-hour capacity of 1.2 million board feet, produced an average of 375 million board feet of lumber annually. Although production dropped off in the early 1930's and reached a low of 87 million in 1932, it increased gradually until the World War II period and averaged 333 million board feet during the 5 years, 1941-45. More recently, in 1952, some 35 sawmills, with a combined capacity of nearly 1.5 million feet, manufactured 268 million feet of lumber.

Large volumes of logs have moved both in and out of the county to be milled. Much of the log volume cut during the years of high production were exported to sawmills chiefly in neighboring Multnomah and Clatsop counties. At the same time sawmills in the county were importing logs via the Columbia River market. In recent years the county's substantial lumber production has been maintained very largely through imported logs.

FOREST UTILIZATION

Lodging and sawmilling operations in Columbia County were among the earliest in Oregon. They began with the first white settlements in the area, some of which date back to about 1830. These early operations selectively cut the large high-grade timber growing on the Columbia River and shipped the logs to the water by bulk boats. They remained small scale until about 1910 when railroad and highway logging began opening up practically all portions of the county to supply logs for a rapidly growing sawmill industry on the Columbia River. By the 1930's the county's log production was largely large scale and, with the exception of a few small sawmills, the largest in the State. A peak production was reached in 1927 when a total of 527 million board feet of logs was reported. The average annual production for the five years, 1923-27, was 425 million.

A decline in log production began in 1930 and continued through 1935 as the several different large timber holdings were cut out. The decline extended until 1951 when a total of only 22 million board feet of logs was reported; since then production has started climbing as some of the young-growth stands are beginning to be harvested. Production in 1954 was 22 million board feet.

Because of its strategic location on the Columbia River, nearly all classes of shipping, the county has long had a large installed capacity of sawmills. Two pulp plants, built in the late 1920's, have operated continuously and there have been various other sawmills. During a period of peak operations, 1925-29, sawmills in the county with a combined 8-hour capacity of 1.2 million board feet, produced an average of 175 million board feet of lumber annually. Although production dropped off in the early 1930's and reached a low of 87 million in 1935, it increased gradually until the World War II period and averaged 325 million board feet during the 5 years, 1941-45. More recently, in 1953, some 25 sawmills with a combined capacity of nearly 1.5 million feet, manufactured 25 million feet of lumber.

Table 1.--Land area by major classes of land, 1954

Class of land				Area
				<u>Acres</u>
Forest:				
Commercial				341,640
Noncommercial				-
Productive-reserved				-
Unproductive				-
Total				341,640
Nonforest				79,320
Total, all classes				420,960

Table 2.--Area of commercial forest land by ownership and stand-size classes, 1954

Ownership class	Total	Saw-timber stands	Pole-timber stands	Seedling and sapling stands	Nonstocked areas
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
Private	314,620	105,040	137,540	71,720	320
State	10,600	3,320	3,880	3,290	110
County	870	120	590	160	
Municipal	4,420	1,780	2,560	80	
Federal: Bureau of Land Management	11,130	1,250	4,830	5,050	
All ownerships	341,640	111,510	149,400	80,300	430

Table 3.--Area of commercial forest land by major forest type and stand-size class, 1954

Forest type	Total Acres	Sawtimber stands		Pole- timber stands Acres	Seedling and sapling stands Acres	Non- stocked areas Acres
		Large <u>1/</u> Acres	Small <u>2/</u> Acres			
Douglas-fir	314,840	14,830	84,500	138,570	76,940	
Hemlock-Sitka spruce	870	40	400	390	40	
Hardwoods	25,500		11,740	10,440	3,320	
Nonstocked areas	430					430
Total	341,640	14,870	96,640	149,400	80,300	430

1/ 21 inches d.b.h. and larger.

2/ 11 to 21 inches d.b.h.

Table 3.--Area of commercial forest land by ownership and stand-size class, 1954

Ownership class	Total Acres	Saw- timber stands Acres	Pole- timber stands Acres	Seedling and sapling stands Acres	Nonstocked areas Acres
State	314,820	102,040	137,240	71,720	820
Federal	10,600	3,320	3,880	3,220	110
County	370	120	290	160	
Private	4,420	1,780	3,260	80	
Bureau of Land Management	11,130	1,220	4,820	3,020	
Other	341,640	111,210	149,400	80,300	430

Table 4.--Land area by cover type, ownership class, and land-use class, 1954

(Acres)

Cover type	Unreserved						
	Total	Private	State	County	Municipal	Federal	
						Bureau of Land Mgt.	Other ^{1/}
COMMERCIAL FOREST LAND ^{2/}							
Douglas-fir large old-growth saw-timber (yellow fir)	1,450	1,450					
Douglas-fir large young-growth saw-timber (red fir)	12,950	12,440	40		30	440	
Douglas-fir small young-growth saw-timber (red fir)	84,340	79,700	1,990	90	1,750	810	
Douglas-fir poletimber	138,490	127,730	3,290	520	2,120	4,830	
Douglas-fir seedlings and saplings	76,940	68,400	3,290	160	40	5,050	
Western hemlock large sawtimber	40	40					
Western hemlock small sawtimber	400	400					
Western hemlock poletimber	390	190	200				
Western hemlock seedlings and saplings	40	40					
Western redcedar large sawtimber	430	430					
Western redcedar small sawtimber	160	160					
Western redcedar poletimber	80	80					
Hardwood small sawtimber	11,740	10,420	1,290	30			
Hardwood poletimber	10,440	9,540	390	70	440		
Hardwood seedlings and saplings	3,320	3,280			40		
Nonstocked area, recent clearcut	160	160					
Nonstocked area, old clearcut	270	160	110				
Total	341,640	314,620	10,600	870	4,420	11,130	
NONFOREST LAND							
Agricultural	68,110	65,990	1,890	100			130
Grass and brush	4,280	2,550	1,730				
Open--nonvegetative	6,930	5,130	1,220				580
Total	79,320	73,670	4,840	100			710
ALL LAND							
Forest land:							
Commercial	341,640	314,620	10,600	870	4,420	11,130	
Nonforest land	79,320	73,670	4,840	100			710
Total all land	420,960	388,290	15,440	970	4,420	11,130	710

^{1/} Military reservation.^{2/} There is no reserved-commercial (productive-reserved) forest land nor noncommercial (unproductive) forest land in the county.

Table 5.--Area of commercial forest land by forest condition and ownership class, 1954

Forest condition	Ownership class					
	Total Acres	Private Acres	State Acres	County Acres	Municipal Acres	Bureau of Land Mgt. Acres
Conifer large sawtimber						
Uncut	7,580	7,190	40		30	320
Selectively cut	7,290	7,170				120
Total	14,870	14,360	40		30	440
Conifer small sawtimber						
Uncut	76,930	72,370	1,990	90	1,750	730
Selectively cut	7,970	7,890				80
Total	84,900	80,260	1,990	90	1,750	810
Conifer poletimber						
On cutovers	138,640	127,680	3,490	520	2,120	4,830
On other	320	320				
Total	138,960	128,000	3,490	520	2,120	4,830
Conifer seedlings and saplings						
On cutovers	76,140	67,600	3,290	160	40	5,050
On other	840	840				
Total	76,980	68,440	3,290	160	40	5,050
Hardwood small sawtimber	11,740	10,420	1,290	30		
Hardwood poletimber	10,440	9,540	390	70	440	
Hardwood seedlings & saplings	3,320	3,280			40	
Nonstocked, total	430	320	110			
Total	341,640	314,620	10,600	870	4,420	11,130

Table 6.—Area of young-growth timber stands on commercial forest land by stocking class, species group, and stand-size class, 1954

Stocking class and species group	Total young-growth stands Acres	Sawtimber		Pole- timber Acres	Seedlings and saplings Acres
		Large young growth Acres	Small young growth Acres		
Well stocked					
Softwoods	235,260	11,110	77,850	106,560	39,740
Hardwoods	21,760		10,130	9,230	2,400
Total	257,020	11,110	87,980	115,790	42,140
Medium stocked					
Softwoods	70,090	1,840	6,980	31,100	30,170
Hardwoods	3,700		1,570	1,210	920
Total	73,790	1,840	8,550	32,310	31,090
Poorly stocked					
Softwoods	8,440		70	1,300	7,070
Hardwoods	40		40		
Total	8,480		110	1,300	7,070
All classes					
Softwoods	313,790	12,950	84,900	138,960	76,980
Hardwoods	25,500		11,740	10,440	3,320
Total	339,290	12,950	96,640	149,400	80,300

Table 7.—Net volume of live sawtimber and growing stock on commercial forest land by ownership class, 1954

Ownership class	Sawtimber		Growing stock
	<u>Million board feet, log scale, Scribner rule</u>	<u>Million board feet International ¼-inch rule</u>	<u>Million cubic feet</u>
Private	2,258	2,553	626
State	70	80	19
County	4	4	1
Municipal	39	44	11
Federal: Bureau of Land Management	35	39	11
All ownerships	2,406	2,720	668

Table 8.—Net volume of live sawtimber and growing stock on commercial forest land by stand-size class, 1954

Stand-size class	Sawtimber		Growing stock
	<u>Million board feet log scale, Scribner rule</u>	<u>Million board feet, International ¼-inch rule</u>	<u>Million cubic feet</u>
Sawtimber stands	2,043	2,309	515
Poletimber stands	360	408	152
Seedling and sapling stands	3	3	1
Nonstocked areas	<u>1/</u>	<u>1/</u>	<u>1/</u>
Total	2,406	2,720	668

1/ Less than 500 thousand

Table 9.—Net volume of live sawtimber and growing stock
on commercial forest land by species, 1954

Species	Sawtimber		Growing stock
	<u>Million board feet,</u> <u>log scale,</u> <u>Scribner rule</u>	<u>Million board feet,</u> <u>International</u> <u>4-inch rule</u>	<u>Million</u> <u>cubic feet</u>
Softwoods:			
Douglas-fir	1,898	2,155	478
Western hemlock	23	25	7
Sitka spruce	6	6	2
Western redcedar	108	114	40
Grand fir	106	115	21
Total	2,141	2,415	548
Hardwoods: <u>1/</u>			
Red alder	179	206	86
Bigleaf maple	60	69	18
Oregon white oak	26	30	16
Total	265	305	120
All species	2,406	2,720	668

1/ Black cottonwood and Oregon ash occur in limited quantities but no trees of these species were found on the sample plots.

Table 10.--Net volume of live sawtimber on commercial forest land by diameter-class group and log rule, 1954

Diameter-class group	Live sawtimber volume	
	<u>Million board feet, log scale, Scribner rule</u>	<u>Million board feet, International 4-inch rule</u>
11.0" to 20.9" d.b.h.	1,675	1,929
21.0" to 30.9" d.b.h.	580	630
31.0" to 40.9" d.b.h.	116	123
41.0" d.b.h. and larger	35	38
All diameter classes	2,406	2,720

Table 11.--Net volume of all timber on commercial forest land
by class of material and species group, 1954

Class of material	Total	Softwoods	Hardwoods
	<u>Million</u> <u>cubic feet</u>	<u>Million</u> <u>cubic feet</u>	<u>Million</u> <u>cubic feet</u>
Growing stock:			
Sawtimber trees:			
Sawlog portion	463	404	59
Upper stem portion	35	31	4
Total	498	435	63
Poletimber trees	170	113	57
Total growing stock	668	548	120
Other material:			
Sound cull trees	<u>1</u> /	<u>1</u> /	
Rotten cull trees	2	1	1
Salvable dead trees	7	7	
Total other material	9	8	1
Total, all timber	677	556	121

1/ Less than 500 thousand.

Table 12.--Average annual cut from live sawtimber and growing stock on
commercial forest land by species group for the period
1950-1954 incl.

Species group	Sawtimber						Growing stock		
	Timber products	Logging residues	Annual cut ^{1/}	Timber products	Logging residues	Annual cut ^{1/}	Timber products	Logging residues	Annual cut ^{1/}
	Thousand board feet, log scale, Scribner rule			Thousand board feet, International $\frac{1}{4}$ -inch rule			Thousand cubic feet		
Softwoods	46,759	4,564	51,323	52,861	5,159	58,020	12,982	1,605	14,587
Hardwoods	5,779	564	6,343	6,533	638	7,171	1,307	162	1,469
Total	52,538	5,128	57,666	59,394	5,797	65,191	14,289	1,767	16,056

^{1/} Annual cut is sum of timber products and logging residues.

FOREST SURVEY PROCEDURE

The procedures used in the second Forest Survey reinventory of the forests of Columbia County were materially different from the procedures used in the initial inventory and first reinventory. This change in procedures accounts for some significant differences in both the forest-area and timber-volume statistics obtained. Therefore, a brief description of procedures used in each inventory is in order.

Initial Inventory

The initial inventory of the county's forests was conducted in 1930 by what is known as the "compilation method." In this method existing information on forest types, timber cruises, and other pertinent data were collected from private timber owners and various public agencies. These data were checked in the field for reliability and, in case of timber cruises, they were adjusted to the specifications and standards of Forest Survey. Forest-type and timber-volume data for areas not covered by existing information were obtained through intensive field reconnaissance. Timber-volume estimates for immature stands were determined from normal yield tables adjusted for site, age, and density of stand.

All land in the county was classified as either forest or non-forest. Forest land was further classified as commercial or noncommercial; the commercial forest land was still further classified by type, stand-size class, and, in case of young-growth stands, by stocking and age classes. These types and classes were delineated on 1-inch-to-the-mile base maps of each township. These township type maps were then superimposed over ownership-status plats and dot-counted to obtain forest-type-area statistics by ownership class. Type delineations on the township maps were traced on a base map of the county to form a county forest type map.

First Reinventory

The first reinventory, in 1938, included a complete revision of the forest type map of the county. For this revision, records of cutting and other forms of drain, since the original inventory, were obtained from various sources and verified in the field by ground reconnaissance. Areas on which the type had changed due to cutting, restocking of cutover or burned-over land, and ingrowth of immature stands were remapped on the ground. The ownership status was brought up to date. On the basis of the new ownership data and the revised forest type map, area statistics by forest types were recomputed.

Timber-volume estimates for mature sawtimber stands were based on cruise data collected during the original survey, adjusted for cutting and other drain that had occurred during the interval between inventories. Volume estimates for immature stands were based on yield tables adjusted for site, age, and density of stand.

Second Reinventory

In the second reinventory, in 1954, the forest type map was completely revised. This revision was accomplished through interpretation, classification, and field mapping on aerial photos covering all of the land area. In the mapping on aerial photos, types whose classification was difficult were examined more closely in the field. Likewise, species composition of mixed stands was checked on the ground. The use of aerial photos in mapping resulted in type delineations of much greater accuracy and detail than were possible through the ground reconnaissance employed in the initial inventory and first reinventory. In the preparation of a revised type map, the delineations on the aerial photos were transferred to a 2-inch county base map through use of a photo projector. The new type map was then superimposed over a current ownership map of complete county coverage and a dot count made of forest type areas by ownership class.

Volume estimates each of live sawtimber, growing stock, and salvable dead material were calculated by applying average per-acre volumes to the appropriate forest type acreages. The average per-acre volumes for sawtimber stands and poletimber stands were obtained through a sampling procedure in which the stands were measured on randomly selected plots. In the random selection of samples each individual sawtimber or poletimber stand in the county had an equal chance of being selected. A sample consisted of a cluster of 3 one-fifth-acre circular plots spaced at regular 6-chain intervals. Intensity of the sampling was so designed as to produce a total estimate of volume in the county of a specified sampling accuracy set by Forest Survey.

Average per-acre volumes of sawtimber and poletimber trees in the overstory of seedling and sapling stands and on nonstocked areas were obtained through an aerial photo plot sampling procedure. A large number of one-acre photo plots was taken in a modified systematic-random pattern. By photo interpretation, estimates were made of average number of trees per acre of both sawtimber and poletimber size, average crown diameter, and total tree height. Gross volume of the average tree was obtained from photo volume tables and then adjusted for defect and breakage in order to obtain net volume.

ACCURACY OF DATA

Forest Area

In the second reinventory of the forests of the county, in-place mapping of the forests and their classification by forest type, stand-size class, or condition class were on the basis of a 100-percent coverage. Thus no error because of sampling was involved. Errors due to techniques or judgment in the field and in office computation of data were possible, but difficult to evaluate. Throughout all phases of the work close supervision and frequent checks assured a high level of accuracy and uniformity of standards.

Timber Volume

For the timber volume, derived from sampling surveys, the chances are about 19 out of 20 that the board-foot volume of live sawtimber, if measured by a 100-percent cruise, would be within plus or minus 28.62 percent of the reinventory's estimated total of 2,406 million board feet, log scale, Scribner rule. On the same basis the cubic-foot volume of growing stock from a 100-percent cruise would be within a range of plus or minus 21.80 percent. The volume estimates by species, stand-size class, or other subdivision, have greater sampling errors than the county totals.

$$\begin{aligned} SE &= 9\% \text{ in } 100 \\ &= 10.9\% \sqrt{.668} \\ &= 10.9\% (.817) \\ &= 8.9\% \end{aligned}$$

DIFFERENCE IN RESULTS OF INVENTORIES

Some of the differences in forest-type and timber-volume statistics resulting from the initial inventory and first reinventory, and those obtained in the second reinventory are due to actual physical change such as the cutting of stands, restocking of deforested areas, and ingrowth of stands into the next larger size class. Other differences are due to variations between inventories in the procedures used in interpretation and classification of forest conditions and in standards of utilization. Differences such as these preclude direct comparison of some of the statistics; comparison of other statistics is meaningful only after the statistics have been adjusted to common standards.

Forest Area

The forest land areas, classified by stand-size and condition classes, resulting from the three inventories, are shown in the table below:

Inventory	Total forest land	Commercial forest land					Noncommercial forest land
		Total	Saw-timber	Pole-timber	Seedlings and saplings	Nonstocked area	
			Thousands of acres				
1932	344	344	86	49	35	174	*
1938	345	345	71	64	70	140	*
1954	342	342	112	149	81	*	

* Less than 500 acres.

With the exception of the seedling and sapling stands and nonstocked areas, the acreages shown in the table for a given class are on a comparable basis as far as specifications are concerned. For example, the sawtimber and poletimber stands included in the acreages of these two stand-size classes for 1932 and 1938 have been adjusted to the same specifications as used in 1954. This means the sawtimber stands are comprised of trees 11.0 inches d.b.h. and larger, and poletimber stands include trees from 5.0 to 10.9 inches d.b.h. The seedling and sapling acreages for all three inventories include stands of trees from 0 to 4.9 inches d.b.h., but those for 1932 and 1938 do not include stands on areas clearcut during the past 10 years that may have been restocked at the time of the inventory; such land was included in the nonstocked class. The 1954 acreage does include areas of land cut in the past 10 years if they were stocked with seedlings and saplings at the time of reinventory. This difference in classification procedure had a corresponding effect on the acreages of nonstocked areas; i.e., the 1932 and 1938 acreages included all recently clearcut land, cut in prior 10 years, regardless of status of restocking at time of inventory; the 1954 acreage does not include the area of such land as had become restocked or had advance growth in 1954. The 1932 nonstocked acreage included 117 thousand acres of recent clearcut land; the 1938 acreage included 33 thousand acres. The 1954 inventory found only 160 acres of recent clearcut land in a nonstocked condition.

The two-thousand-acre decrease in total forest land area between 1932 and 1954 was due chiefly to land clearing for agricultural use.

Analysis of the sawtimber acreages for the three inventories shows the area of large old-growth Douglas-fir stands (trees more than 40 inches d.b.h.) to have been 23 thousand acres in 1932, 14 thousand acres in 1938, and about one thousand in 1954.

Timber Volume

The estimated net volume of live sawtimber at time of the three inventories, by broad age class of timber, is shown in the following tabulation. The volumes shown for 1932 and 1938 have been adjusted to the same specifications and standards of utilization upon which the 1954 volumes are based. The age break between old-growth and young-growth timber is about 160 years.

Inventory	Old-growth timber	Young-growth timber	Total
<u>Million board feet, log scale, Scribner rule</u>			
1932	2,161	654	2,815
1938	1,299	502	1,801
1954	86	2,320	2,406

The respective volumes of old-growth and young-growth timber shown in the tabulation trace the trend in the timber-supply situation in the county. The 1932 inventory was made near the end of a period of peak logging activity when the annual production of logs exceeded a half billion board feet. At that time half of the 2.1 billion board feet of old-growth timber was in Douglas-fir trees more than 40 inches d.b.h.; the other half was chiefly of Douglas-fir from 20 to 40 inches d.b.h. with some volume of western hemlock, western redcedar, and the true firs. The young-growth volume was chiefly in stands from 80 to 160 years of age that had restocked burns.

The 1938 inventory found that the volume of both the old-growth and young-growth timber had been decreased materially during the period between inventories. Of the some 10 private owners who held large acreages of timber in the county during the 1920's, all but three had cut out their holdings by 1938 and these three had greatly reduced their acreages of uncut timber. Only a comparatively few of the young-growth stands that had restocked the cutover lands had reached sawtimber size (11.0 inches d.b.h. and larger).

In 1954 the remaining old-growth timber volume was found either in a few small remnant stands or in occasional scattered trees in the overstory of young stands. Approximately 88 percent of the volume of young-growth sawtimber was in young stands that had restocked the cutover land; the remaining 12 percent was on restocked burns.

An important factor in a consideration of past and present timber volumes in the county is a comparison of the quality of the timber. The major portion of the volume of old-growth Douglas-fir in the county in the 1932 inventory was of large, slow-growing, fine-grained

timber. Such timber, known as "yellow fir" by the lumber industry, produced a high percentage of the upper grades of lumber. It was also a source of high-grade, large-diameter, peeler logs during the earlier years of the plywood industry. The young-growth timber, comprising such a large part of the 1954 sawtimber inventory is a fast-growing, coarse-grained timber suitable for dimension lumber, ties, and common boards. No doubt some of it will be utilized for pulp. Also, some of the larger young timber will probably be peeled for a sheathing-grade plywood.

Inventory	Old-growth timber	Young-growth timber	Total
1933	2,161	1,334	3,495
1954	2,161	1,334	3,495

The 1933 inventory of old-growth timber in Douglas-fir country was 2,161 million board feet, or 83 percent of the total inventory. The 1954 inventory of old-growth timber was 2,161 million board feet, or 62 percent of the total inventory. The 1933 inventory of young-growth timber was 1,334 million board feet, or 38 percent of the total inventory. The 1954 inventory of young-growth timber was 1,334 million board feet, or 38 percent of the total inventory. The 1933 inventory of total timber was 3,495 million board feet, or 100 percent of the total inventory. The 1954 inventory of total timber was 3,495 million board feet, or 100 percent of the total inventory.

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DEFINITION OF TERMS USED

Land Area

Total Land Area

Includes dry land and unmeandered water surface.

Forest Land Area

Includes (a) land which is at least 10-percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting an influence on the climate or on the water regime; and (b) land from which the trees described in "(a)" have been removed to less than 10-percent stocking and which has not been developed for other use. Minimum area of forest land recognized in reinventory of the county is 10 acres.

Nonforest Land Area

Land that does not qualify as forest land. Minimum area recognized in the reinventory of the county is 10 acres.

Forest Land Classes

Commercial Forest Land Area

Forest land which is producing, or is physically capable of producing, usable crops of wood, economically available now or prospectively, and not withdrawn from timber utilization.

Noncommercial Forest Land Area

Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land, and (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Types

Forest Land Types

Forest land is typed on the basis of predominant species as indicated by cubic volume for sawtimber and poletimber stand, and number of trees for seedling and sapling stands, or as a forest condition such as nonstocked cutover, or burned-over land. Where none of

the indicated species comprises 50 percent or more of a given stand, the stand is typed on the basis of plurality of cubic volume or number of trees. In classifying forest land by type the minimum area recognized is 40 acres.

Commercial Forest Land

Major forest types. Local forest types are grouped into generalized types. The major forest types in Columbia County are as follows:

Douglas-fir. Forests in which 50 percent or more of the stand is Douglas-fir.

Hemlock-Sitka spruce. Forests in which 50 percent or more of the stand is hemlock or Sitka spruce.

Hardwood. Forests in which 50 percent or more of the stand is red alder, bigleaf maple, Oregon white oak, or other western hardwoods, singly or in combination.

Noncommercial Forest Land

Productive-reserved. Forest land withdrawn from timber utilization through statute, ordinance, or administrative order, but which otherwise qualifies as commercial forest land.

Unproductive. Forest land incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Nonforest Land Types

Agricultural. Cultivated land or stump pasture.

Grass and brush. Grass or brush on nonforest land.

Open-nonvegetative. Includes barrens, tideflats, towns, and unmeandered water.

Tree Classes

Sawtimber Tree

Tree of commercial species, 11 inches d.b.h. or larger, that contains at least one 16-foot coniferous sawlog or one 8-foot hardwood sawlog to a variable top diameter never less than 8 inches inside the bark. Also, 25 percent or more of the gross board-foot volume must be free from rot or defect.

Poletimber Tree

Softwood or hardwood tree 5.0 to 10.9 inches d.b.h. of commercial species in which 25 percent or more of the gross cubic-foot volume is free from rot and defect.

Seedling and Sapling Trees

Live trees of commercial species less than 5.0 inches d.b.h. and of good form and vigor.

Cull Tree

Live tree of sawtimber or poletimber size that is unmerchantable, now or prospectively, because of defect, rot, or species.

Sound cull tree. Live tree of sawtimber or poletimber size which contains 25 percent or more of sound volume but will not make at least one merchantable log, now or prospectively, because of roughness or poor form.

Rotten cull tree. Live tree of sawtimber or poletimber size in which less than 25 percent of the total volume is sound.

Salvable Dead Tree

Standing dead or down tree which contains 25 percent or more of sound volume and at least one merchantable 16-foot coniferous or 8-foot hardwood log.

Stand-Size Classes

Sawtimber Stand

Stand of sawtimber trees having a minimum net volume per acre as follows: 5,000 board feet, log scale, International $\frac{1}{4}$ -inch rule, in any species except hardwoods; 1,500 board feet in hardwoods.

Large sawtimber stand. Stand in which the majority of the volume is in trees more than 21.0" d.b.h.

Small sawtimber stand. Stand in which the majority of the volume is in trees from 11.0" to 20.9" d.b.h.

Poletimber Stand

Stand failing to meet sawtimber-stand specifications but at least 10-percent stocked with poletimber and larger (5.0" d.b.h. and larger) trees and at least half the minimum stocking in poletimber trees.

Seedling and Sapling Stand

Stand not qualifying as either sawtimber or poletimber stand but having at least 10-percent stocking of trees of commercial species and with at least half the minimum stocking in seedling and sapling trees.

Uncut Sawtimber Stand

Sawtimber stand that is essentially undisturbed by cutting.

Selectively Cut Sawtimber Stand

Sawtimber stand in which a partial harvest has been made, and in which the residual volume amounts to 5,000 board feet or more per acre.

Stocking

Stocking is the extent to which growing space is effectively utilized by present or potential growing stock trees of commercial species. "Degree of stocking" is synonymous with "percent of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Stocking may be measured in terms of number of trees, volume, basal area, cover canopy, or other criterion, or combination of criteria.

Well-stocked stands. Stands that are 70 percent or more stocked with present or potential growing stock trees.

Medium-stocked stands. Stands that are 40 to 69 percent stocked with present or potential growing stock trees.

Poorly stocked stands. Stands that are 10 to 39 percent stocked with present or potential growing stock trees.

Nonstocked areas. Areas that are 0 to 10 percent stocked with present or potential growing stock trees.

Timber Volume

Live Sawtimber Volume

Net volume in board feet of live sawtimber trees of commercial species.

Scribner rule. The common board-foot rule used in determining log-scale volume of sawtimber in the Pacific Northwest.

International $\frac{1}{4}$ -inch rule. The standard board-foot rule adopted nationally by the Forest Service in the presentation of Forest Survey volume statistics.

Growing Stock

Net volume in cubic feet of live sawtimber trees and live pole-timber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

All-Timber Volume

Net volume in cubic feet of live and salvable dead sawtimber trees and poletimber trees of commercial species, and cull trees of all species from stump to a minimum 4.0-inch top inside bark.

Tree Species

Tree species commonly found in Columbia County include:

Softwoods: Douglas-fir (Pseudotsuga menziesii)
Western hemlock (Tsuga heterophylla)
Sitka spruce (Picea sitchensis)
Western redcedar (Thuja plicata)
Grand fir (Abies grandis)

Hardwoods: Red alder (Alnus rubra)
Bigleaf maple (Acer macrophyllum)
Oregon white oak (Quercus garryana)
Oregon ash (Fraxinus latifolia)
Black cottonwood (Populus trichocarpa)

Timber Cut

Annual Cut of Live Sawtimber

The net board-foot volume of live sawtimber trees cut or killed by logging on commercial forest land during a specified year.

Timber products from live sawtimber. The volume of timber products cut from live sawtimber.

Logging residues from live sawtimber. The net board-foot volume of live sawtimber trees cut or killed by logging on commercial forest land and not converted to timber products.

Annual Cut of Growing Stock

The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging on commercial forest land during a specified year.

Timber products from growing stock. The volume of timber products cut from growing stock.

Logging residues from growing stock. The net cubic-foot volume of growing stock cut or killed by logging on commercial forest land and not converted to timber products.